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Perceptions of a Virtual Visiting Ophthalmology Elective in the COVID-19 Era

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Abstract

Background The coronavirus disease 2019 (COVID-19) pandemic was a disruption for all aspects of medical education, especially for clinical students preparing for residency applications. Clinical rotations are essential for a student's specialty choice, especially for subspecialties such as ophthalmology where students may not get significant exposure during preclinical years. The cancellation of home and visiting ophthalmology electives due to the pandemic brought a need for newer, innovative ideas of instruction.

Methods A 4-week not-for-credit virtual elective was developed at the Department of Ophthalmology for visiting medical students and was offered from August to October 2020. Visiting fourth-year medical students were paired with faculty and resident mentors for one-on-one virtual mentoring, in addition to participation in departmental conferences and research opportunities. Surveys were distributed to students and mentors, and results were analyzed using Microsoft Excel and GraphPad Prism 9.

Results A total of 12 visiting fourth-year medical students participated in the virtual elective, 67% of whom did not have a home ophthalmology program. There was a significant increase in students' perception of their ophthalmology knowledge, with all of students reporting that the elective contributed to this. Students (100%) were "very satisfied" with their faculty mentors on a five-point Likert scale, with high satisfaction from faculty and resident mentors toward students also. The two required events in the elective, the journal club and case virtual conferences, were highly rated from students and mentors.

Conclusion The virtual ophthalmology elective, which was developed to address medical education gaps due to the COVID-19 pandemic, was favorably viewed by all who participated. As dedicated ophthalmology instruction time has decreased over the years, it may become increasingly more important to turn to virtual resources for ophthalmology instruction and mentorship.

Keywords
- ophthalmology
- medical education
- mentorship
- COVID-19
- virtual rotation

The coronavirus disease 2019 (COVID-19) pandemic brought an unprecedented disruption to medical education and the healthcare system in the United States. On March 17, 2020, the Association of Medical Colleges released a guidance to all medical schools strongly supporting "pausing all student clinical rotations, effective immediately" for at least 2 weeks.[1] Almost overnight, elective surgeries and nonemergency clinic appointments were canceled, and medical students

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were pulled out of their clinical rotations for safety and in an effort to preserve personal protective equipment. Administrators and faculty scrambled to move learning to an online platform, and "Zoom school" became the new standard.

Medical education was impacted for all, but the effects of the pandemic were especially reflected in medical students in the clinical phase of curriculum. Clinical rotations, generally undertaken in a student's third year, are an essential part of undergraduate medical education. These clerkships give students an in-depth look into their specialties of interest and play a significant role in a student's choice of specialty. They are an important source of learning, faculty interaction, and research opportunities. They also play a significant role in mentorship, which has historically relied on face-to-face interaction.

Ophthalmology exposure for medical students has been on a steady decline throughout the past few decades.[2–5] Surveys from the Association of University Professors of Ophthalmology (AUPO) show that in 2018, only 16% of AUPO-affiliated member institutions required some sort of clinical rotation in ophthalmology, down from 68% in 2000.[3,5] Most of these institutions shifted ophthalmology teaching to the preclinical years, with an average coursework of only 12.5 hours.[5] These changes have led to a trend of declining ophthalmic education for the average medical student, resulting in graduating physicians with limited ability to diagnose eye conditions.[6,7] A survey of primary care (family medicine, internal medicine, pediatrics) program directors found that the vast majority believe less than 50% of their entering residents have adequate ophthalmology knowledge.[7] The AUPO recently published an updated list of 12 objectives that every graduating medical student should know, but at the time of said publication, clinical ophthalmic education is not yet included within the Liaison Committee on Medical Education guidelines.[3,8]

With limited required ophthalmology exposure, medical students pursuing ophthalmology as a specialty rely heavily on home and visiting clerkships, both of which were canceled due to the pandemic. Among those hardest hit were students without a home ophthalmology program, for whom visiting clerkships could be their only academic ophthalmology exposure throughout their undergraduate medical career. The academic ophthalmology community went to work, pooling virtual resources for self-directed learning on the American Academy of Ophthalmology Web site. Departmental grand rounds, case conferences, and journal clubs went online, allowing greater accessibility to students. National and regional conferences and clinical clerkships also transitioned to a virtual format, which lessened cost and travel limitations for students.

In response to the pandemic, a not-for-credit virtual ophthalmology elective (VOE) was created at Duke University's Department of Ophthalmology in 2020 for visiting medical students at the start of their fourth year who were interested in ophthalmology to connect with ophthalmology faculty and trainees to increase students' exposure to ophthalmology. We conducted a study to explore perceptions of the visiting medical students, trainees, and attendings who participated in the VOE toward the new e-learning platform, with the goal of providing some insight into challenges and potential solutions to the problems facing medical education due to the COVID-19 pandemic.

Methods

The study protocol was reviewed by the Duke University Institutional Review Board and found to be exempt. Visiting medical students participated in the virtual elective virtually from their respective institutions, and resident and faculty mentors from the Duke Department of Ophthalmology, between August-October 2020. Electronic surveys (Qualtrics, Provo, UT) assessed demographic information, course expectations, and the effects of the elective experience on ophthalmology knowledge and interest for students participating in the VOE and were distributed to all student and mentor (resident and faculty) participants.

Overview of the Virtual Elective

The VOE was a 4-week, interactive program for non-Duke fourth-year medical students interested in ophthalmology. Students who had previously applied for the Duke Department of Ophthalmology visiting elective through the Visiting Student Learning Opportunities program were encouraged to apply for the virtual elective, and VOE students were then selected from that cohort. It consisted of a semistructured format designed to work around concurrent medical school rotations. Opportunities were offered for participation in departmental conferences, one-on-one faculty mentoring sessions, research opportunities, and engagement with residents and faculty. Two required events in the elective were the journal club conference and case conferences. No course credit was offered for the virtual elective.

Student Surveys

Nonanonymous surveys were used for precourse planning, including to match students with resident and faculty mentors. Anonymous precourse surveys included five questions regarding previous ophthalmology exposure, ophthalmology knowledge, number of in-person ophthalmology rotations completed, preference between virtual and in-person visiting ophthalmology electives, and level of interest in the ophthalmology residency program. There were two additional qualitative questions regarding benefits of in-person and virtual visiting ophthalmology electives. Anonymous postcourse surveys included all questions in the precourse survey along with 14 questions regarding the effect of the virtual elective on knowledge and interest in ophthalmology, and level of satisfaction with elements of the elective (resident and faculty mentor experiences, virtual conferences, and group meetings with education leaders). A space was included for comments and open-ended responses. Visiting students filled out postcourse surveys at the end of each 4-week rotation, but responses were not reviewed until all cohorts of students had completed the elective, in an effort to keep responses anonymous.

Mentor Surveys

Anonymous surveys were distributed to resident mentors at the end of each of the 4-week rotations, and to the faculty mentors at the end of the last 4-week rotation, to assess their level of engagement and satisfaction with the elective.

The data were collected and stored in a deidentified fashion using Excel 2016 (Microsoft, Redmond, WA). Descriptive statistics were performed with Excel. To compare pre- and postcourse knowledge and exposure to ophthalmology and mentor/mentee satisfaction, the unpaired *t*-test was performed with GraphPad Prism 9 (GraphPad Software Inc, San Diego, CA).

Results

A total of 12 visiting medical students participated in the VOE, four students in each of the three 4-week sessions (►**Table 1**). The overall response rate for the students was 100% (12 of 12) for the precourse survey and 83% (10) for the postcourse survey. There were seven (58%) female students and five (42%) male students. There were four (33%) underrepresented minority students, and eight (67%) students did not have a home ophthalmology program. Prior to the VOE, seven (58%) students had one in-person ophthalmology rotation.

Table 1 Demographic characteristics of the medical student participants

Gender identity, *n* (%)	
Male	5 (42)
Female	7 (58)
Ethnicity, *n* (%)	
Non-Hispanic/Latino	11 (92)
Hispanic/Latino	1 (8)
Race, *n* (%)[a]	
Asian	5 (42)
Black	4 (33)
White	4 (33)
Underrepresented minority (URM), *n* (%)	
Yes	4 (33)
No	8 (67)
Protected veteran, *n* (%)	
No	12 (100)
Affiliated ophthalmology residency program at your home institution?	
Yes	4 (33)
No	8 (67)
Ophthalmology clerkship offered at your home institution?	
Yes	10 (83)
No	2 (17)

[a]Sum greater than 100% as some individuals are multiracial.

Students' perception of their ophthalmology exposure did not change over the course of the virtual elective, with most students reporting "a moderate amount" of ophthalmology exposure ($p = 0.12$). Students' perception of their ophthalmology knowledge increased over the course of the virtual elective, from six (50%) of the students prior to the elective, to nine (90%) after the elective, reporting having a "good foundation in the basics." One-hundred percent of students reported that the VOE increased their knowledge ($p = 0.047$). With regard to preference for virtual versus in-person experiences, the number of students who reported a preference for a virtual visiting clerkship increased from zero prior to the elective, to 2 (20%) after participating in the virtual elective. One-hundred percent of students reported a positive effect on their opinion of virtual courses (►**Table 2**).

The overall experience of the VOE was positive for the faculty, residents, and visiting students (►**Table 3**). Student and mentor satisfaction was positive: 100% of students reported they were "very satisfied" with their faculty mentors on a five-point Likert scale and 70% were "very satisfied" with their resident mentors. Mentors were also satisfied with their mentees: 66% of faculty mentors were very satisfied with their mentees, and 62.5% of resident mentors were very satisfied with their mentees, although the response rate from the faculty was low. Satisfaction with the virtual journal club and case conference was also high among students, residents, and faculty. One-hundred percent of faculty were very satisfied with both the journal club conference and case conference, and there was a high percentage (90% for the journal club, 80% for the case conference) of very satisfied students as well.

Qualitative feedback (►**Table 4**) about benefits of a virtual elective included an increased "focus on learning, with tailored teaching and mentoring" (6 students). Additional benefits identified included virtual electives being cheaper, more accessible, and more flexible. From mentors, benefits reported were increased accessibility (for students) and increased flexibility (for mentors).

Discussion

The implementation of Duke's first VOE was a success with regard to students' exposure to ophthalmology and to our ability to implement the virtual elective. There was a significant increase in students' self-reported ophthalmic knowledge, with all students attributing the virtual elective as a cause. Students all reported the elective as having a positive effect on their opinion of virtual courses, with some even changing their preference from in-person electives to the virtual format.

As the majority of visiting students were without a home ophthalmology program, there was a large emphasis on mentorship in the elective. Students were paired with both faculty and resident mentors and were encouraged to meet with them as often as mutually possible for individual one-

Table 2 Pre- and postcourse survey results of the medical student participants

			Pre-VOE (12 respondents)	Post-VOE (10 respondents)
Ophthalmology exposure	*How much exposure to ophthalmology have you had?* Number (percent)	A great deal	0	0
		A lot	0	2 (20)
		A moderate amount	9 (75)	7 (70)
		A little	3 (25)	1 (10)
		None at all	0	0
	Mean	$p = 0.12$	2.75	3.1
Ophthalmology knowledge	*Rate the level of your knowledge of ophthalmology* Number (percent)	Highly knowledgeable (attending level)	0	0
		Knowledgeable (resident level)	0	0
		Good foundation in the basics	6 (50)	9 (90)
		Some knowledge but many gaps	6 (50)	1 (10)
		Very little knowledge	0	0
	Mean	$p = 0.047$	2.5	2.9
Effect of the VOE on your knowledge Number (percent)		Increased		10 (100)
		No change		0
		Decreased		0
Number of in-person ophthalmology rotations Number (percent)		0 rotations	1 (8)	0
		1 rotation	7 (58)	4 (40)
		2 rotations	3 (25)	5 (50)
		3 or more	1 (8)	1 (10)
Preference for in-person versus virtual rotation		In-person	11 (92)	8 (80)
		No preference	1 (8)	0
		Virtual	0	2 (10)
Effect of the VOE on your preference Number (percent)		More positive		10 (100)
		No change		0
		More negative		0
Interest in Duke Residency Number (percent)		Very interested	12 (100)	10 (100)
		Somewhat interested	0	0
		Neither interested nor disinterested	0	0
		Somewhat disinterested	0	0
		Very disinterested	0	0
Effect of the VOE on your preference Number (percent)		Increased		10 (100)
		No change		0
		Decreased		0

Abbreviation: VOE, virtual ophthalmology elective.

on-one mentorship, as well as for assistance with their conference presentations. There was a high degree of student satisfaction toward both faculty and resident mentors. Mentor satisfaction toward students was more moderate, likely due to competing priorities they were facing themselves during the pandemic and busy academic year. The two culminating events of the elective, the journal club conference and case conference, were very highly rated by students and mentors alike. While in-person electives were still preferred, some features of the virtual elective were superior, such as the one-on-one mentoring and accessibility.

Table 3 Student and mentor satisfaction with the virtual elective components

		Medical students (10 respondents) Response rate 83%	Faculty mentors (3 respondents) Response rate 33%	Resident mentors (8 respondents) Response rate 67%
Satisfaction with faculty mentors, number	Very satisfied	10		
	Somewhat satisfied	0		
	Neither	0		
	Somewhat unsatisfied	0		
	Very unsatisfied	0		
Satisfaction with resident mentors, number	Very satisfied	7		
	Somewhat satisfied	3		
	Neither	0		
	Somewhat unsatisfied	0		
	Very unsatisfied	0		
Satisfaction with medical student mentee, number	Very satisfied		2	5
	Somewhat satisfied		1	1
	Neither		0	2
	Somewhat unsatisfied		0	0
	Very unsatisfied		0	0
Satisfaction with mentor—mentee, mean	$p = 0.064$ (students/faculty) $p = 0.045$ (students/residents) $p = 0.62$ (faculty/residents)	5	4.7	4.4
Satisfaction with journal club conference, number	Very satisfied	9	3	5
	Somewhat satisfied	1	0	1
	Neither	0	0	2
	Somewhat unsatisfied	0	0	0
	Very unsatisfied	0	0	0
Mean	$p = 0.60$ (students/faculty) $p = 0.11$ (students/residents) $p = 0.28$ (faculty/residents)	4.9	5	4.4
Satisfaction with case conference, number	Very satisfied	8	3	5
	Somewhat satisfied	2	0	1
	Neither	0	0	2
	Somewhat unsatisfied	0	0	0
	Very unsatisfied	0	0	0
Mean	$p = 0.44$ (students/faculty) $p = 0.21$ (students/residents) $p = 0.28$ (faculty/residents)	4.8	5	4.4

Table 4 Summary of qualitative responses on the benefits of a virtual elective

Comments from medical students	Comments from mentors
Focus on learning, with tailored teaching and mentoring (6)	Exposure to different Ophthalmology programs (4)
Cheaper (4)	Increased accessibility (for students)
More accessible (3)	Increased flexibility (for mentors)
More flexible (3)	Faculty comment: "I can participate when my clinics occur at satellite facilities only"
Ability to do with concurrent rotations (2)	Resident comment: "Better than nothing!" (during the pandemic)

Number of respondents who noted this response.

There were several virtual ophthalmology clinical electives implemented during the pandemic that have been described.[4,9–12] The formats and curricula varied, but the constant theme was ophthalmic tele-education in the COVID-19 era. DeVaro et al developed a tele-ophthalmology elective for third- and fourth-year medical students consisting of self-directed online learning, student presentations, case-based discussions led by faculty, and optional telehealth observations.[9] Tsui et al implemented a virtual ophthalmology shadowing clerkship elective, using a departmental iPhone and teleconferencing software to include students as part of patient encounters, including virtual slit lamp examinations.[10] Our elective was different in that no course credit was offered and the intention was for it to be taken concurrent with the student's other clinical rotations. There was not, therefore, a strong didactic component and instead a heavy focus on one-on-one mentorship, to allow for teaching and learning to be tailored to a student's individual gaps and needs. Nevertheless, the students in our elective did report increased ophthalmology knowledge, as seen with DeVaro et al, even though their elective contained a strong didactic component.[9]

Incorporation of a virtual curriculum into ophthalmic education is not a recent phenomenon.[13–15] As time dedicated to ophthalmology in medical schools has waned over the years, there has been a push to develop innovative ideas to better incorporate ophthalmic education into the curriculum. These ideas have focused on how to maximize the limited time allotted to ophthalmology, rather than trying to increase teaching time which existing trends have shown may not be a realistic option.[2] One possibility is to integrate ophthalmic education into existing surgical or family medicine clerkships, rather than having standalone rotations.[2] Studies also have shown high student satisfaction with virtual and/or hybrid ophthalmology electives.[13,14,16] One study found that 76% of students preferred ophthalmology eLearning compared with traditional lectures.[14] Most of these studies focus on ophthalmic education, and to our knowledge, there has not been a study focusing on virtual ophthalmology mentorship. Our results suggest that the advantages of the virtual curriculum in ophthalmic learning can be expanded to the area of mentorship, with similar student satisfaction.

The benefits of mentorship in undergraduate medical education are well documented.[17–19] Formal and informal mentorship initiatives have historically relied on face-to-face interactions between students and attendings/residents. Without the option for this in the pandemic, new ideas were formed. Social media played a big role with open communication and increased access to resources that typically would have been limited at the institutional level.[20,21] #MedTwitter, an online community of professionals who have created an open source, decentralized forum for networking, allows students direct access to attendings, program directors, and more—connections that can expand far beyond a student's home institution.[21] A virtual ophthalmology mentorship program was developed to pair mentors and mentees, prioritizing students without home programs.[22] Our virtual elective adds to the evolving climate and could be particularly useful for clinical students with no home ophthalmology program. With relatively low time requirements, it can be added to an existing ophthalmology curriculum or offered as an option for students with preexisting interest in ophthalmology.

Limitations of our study include the fact that not all students completed the post-VOE survey, although our response rate of 83% is not unfavorably low. The response rate of 33% from faculty mentors, however, was very low, limiting meaningful conclusions about their quantitative feedback. Additionally, since mentor satisfaction toward the students was not as robust as students toward mentors, qualitative feedback on this aspect of the course is needed. This was an optional rotation for fourth-year students interested in ophthalmology, suggesting selection bias, and it is unclear how these results could be generalized to third- or fourth-year students without a preexisting interest in ophthalmology. Lastly, all surveys were based on subjective perceptions of knowledge. Including an assessment of ophthalmology knowledge, such as a pre- and posttest, could be done to confirm whether the students' perceptions of their increased ophthalmology knowledge were factual.

Conclusion

In the changing face of medicine, it is necessary for those in ophthalmology education to adapt as times change. While the COVID-19 pandemic may have accelerated the push, there has been a growing trend toward increased virtual ophthalmology instruction for some time. This study showed that a virtual elective increased students' interest in and knowledge of ophthalmology, with virtual mentorship playing a key role.

Conflict of Interest
None.

References

1 Important Guidance for Medical Students on Clinical Rotations During the Coronavirus (COVID-19) Outbreak. AAMC. https://www.aamc.org/news-insights/press-releases/important-guidance-medical-students-clinical-rotations-during-coronavirus-covid-19-outbreak. Accessed Oct 26, 2021
2 Albert DM, Bartley GB. A proposal to improve ophthalmic education in medical schools. Ophthalmology 2014;121(06):1157–1159
3 Shah M, Knoch D, Waxman E. The state of ophthalmology medical student education in the United States and Canada, 2012 through 2013. Ophthalmology 2014;121(06):1160–1163
4 Mishra K, Boland MV, Woreta FA. Incorporating a virtual curriculum into ophthalmology education in the coronavirus disease-2019 era. Curr Opin Ophthalmol 2020;31(05):380–385
5 Moxon NR, Goyal A, Giaconi JA, et al. The State of Ophthalmology Medical Student Education in the United States: an update. Ophthalmology 2020;127(11):1451–1453
6 Chan TY, Rai AS, Lee E, Glicksman JT, Hutnik CM. Needs assessment of ophthalmology education for primary care physicians in training: comparison with the International Council of Ophthalmology recommendations. Clin Ophthalmol 2011;5:311–319
7 Stern GAThe Association of University Professors of Ophthalmology Education Committee. Teaching ophthalmology to primary care physicians. Arch Ophthalmol 1995;113(06):722–724
8 Graubart EB, Waxman EL, Forster SH, et al. Ophthalmology objectives for medical students: revisiting what every graduating medical student should know. Ophthalmology 2018;125(12):1842–1843
9 DeVaro SN, Uner OE, Khalifa YM, Graubart EB. Ophthalmology education in COVID-19: a remote elective for medical students. J Acad Ophthalmol 2020;12(02):e165–e170
10 Tsui E, Wells MB, Mohamed M, Felix CM, Giaconi JA. Virtual ophthalmology rotations—a real possibility during the COVID-19 pandemic and beyond. J Acad Ophthalmol 2020;12(02):e195–e199
11 Wendt S, Abdullah Z, Barrett S, et al. A virtual COVID-19 ophthalmology rotation. Surv Ophthalmol 2021;66(02):354–361
12 Scanzera AC, Cole E, Valikodath N, et al. Implementation of COVID-19 protocols and tele-triage in an academic ophthalmology department. J Acad Ophthalmol 2020;12(02):e151–e158
13 Succar T, Zebington G, Billson F, et al. The impact of the Virtual Ophthalmology Clinic on medical students' learning: a randomised controlled trial. Eye (Lond) 2013;27(10):1151–1157
14 Petrarca CA, Warner J, Simpson A, et al. Evaluation of eLearning for the teaching of undergraduate ophthalmology at medical school: a randomised controlled crossover study. Eye (Lond) 2018;32(09):1498–1503
15 Borgersen NJ, Henriksen MJV, Konge L, Sørensen TL, Thomsen ASS, Subhi Y. Direct ophthalmoscopy on YouTube: analysis of instructional YouTube videos' content and approach to visualization. Clin Ophthalmol 2016;10:1535–1541
16 Wu DJ, Greenberg PB. A self-directed preclinical course in ophthalmic surgery. J Surg Educ 2016;73(03):370–374
17 Platz J, Hyman N. Mentorship. Clin Colon Rectal Surg 2013;26(04):218–223
18 Blanchard RD, Visintainer PF, La Rochelle J. Cultivating medical education research mentorship as a pathway towards high quality medical education research. J Gen Intern Med 2015;30(09):1359–1362
19 Kalén S, Ponzer S, Silén C. The core of mentorship: medical students' experiences of one-to-one mentoring in a clinical environment. Adv Health Sci Educ Theory Pract 2012;17(03):389–401
20 Schmuter G, Tooley AA, Chen RWS, Law JC. Social media in ophthalmology: the educational and professional potential for medical students. J Acad Ophthalmol 2020;12(01):e41–e45
21 Fieger E, Fadel K. #MedTwitter: an open source medical community. MedEdPublish 2021;10(01):. Doi: 10.15694/mep.2021.000019.1
22 @DrAndreaTooley. Attention all ophthalmologists, trainees, and medical students! Are you interested in a virtual mentorship program? Would you like to connect with mentors and mentees? https://twitter.com/drandreatooley/status/1263540705529602049?s=12. Accessed October 26, 2021